PRACTICAL PATHOLOGY.

MYXOMA.

L.P. Clear ground substance, faintly granular.

Numerous deeply-stained points.

Blood vessels numerous, and well-formed walls, usually with numerous small cells round them.

H.P. Clear, homogeneous, intercellular material, containing faint, delicate febrillæ, and large branching cells, whose processes interlace.

Cells protoplasmic, nucleated, granular, and with long processes.

Vessels fully formed, fibrous walls, with small round cells around, lying free in the intercellular substance.

DEGENERATIONS.

Fatty—Minute fatty droplets in protoplasm of cells.

Formation of adipose tissue.

PRACTICAL PATHOLOGY.

CHONDROMA.

L.P. Rounded areas of a clear structureless material (matrix), and containing spaces in which lie cells.

Areas of cartilage separated by a variable amount of connective tissue, with very slight vascular supply.

Spicules of ossification occasionally seen ; are irregular in outline, cells indistinct, and fewer.

H.P. Connective tissue acts as perichondrium to the cartilage, and development of cells and matrix can be traced from it.

(α) Near connective tissue : cells spindle-shaped or oval.

Matrix small in quantity, and deeply stained.

(β) Area of fully-formed cartilage : cells rounded, and fill spaces, nucleated and granular.

Matrix homogeneous, faintly stained.

(γ) Centre of mass : cells do not fill spaces, and often shrivelled, sometimes nucleus obscured by granules.

Matrix almost unstained and clear, with large spaces, or showing granules of calcareous matter.

Degenerations.

H.P. 1. *Ossification*—By deposit of calcareous matter in matrix, and cartilage cells becoming smaller, and changing into branched bone corpuscles.

2. *Myxomatous*—Softening of matrix—cells enlarge, become branched.

3. *Fatty*—Degeneration of cells, minute fatty droplets in the protoplasm of cells.

MYOMA.

L.P. Closely-packed, nucleated, cellular tissue, with irregular, interlacing, and concentric arrangement.

A dotted appearance, due to transverse sections.

Varying amount of fibrous tissue generally surrounding blood vessels which have firm walls.

H.P. Spindle-shaped cells, closely packed into bundles, which interlace.

Longitudinal Section of Bundle.

Rod-shaped nuclei, in spindle-shaped, faintly-granular cells.

Oblique Section.

Oval nuclei, in oval cells—not all sections the same size, and not all nucleated.

Transverse Sections.

Irregularly-rounded cells, differing in size, and only the larger sections containing nuclei.

Blood vessel walls, two or three layers of nucleated cells and delicate fibrils, and endothelial lining.

Degenerations.

Fatty—Minute fatty granules in cells.

Calcification—Minute granules in cells, and loss of nuclear staining.

Œdema—*See* Fibroma.

Fibroid—Increase of fibrous bands in varying proportions.

Mucoid—*See* Myxoma.

SOFT PAPILLOMA.

Cauliflower Growth.

L.P. Branching stalk of fibrous tissue, many of the branches seen only in transverse or oblique section, round which can be seen small epithelial cells, deeply stained.

Fibrous stalk is loose in structure and very cellular, frequently containing large vascular sinuses and numerous capillaries.

Epitheliel covering large in amount, due chiefly to the number of cells between germinal and horny layer, the latter small in amount.

H.P. Fibrous tissue consists of delicate fibrils and numerous small nucleated cells, as seen in inflammatory tissue.

Sinuses and capillaries contain blood corpuscles.

Sinus walls usually mere spaces with endothelial lining.

Epithelium—normal in type, but with larger polygonal cells, many of these being vacuolated round a shrivelled nucleus, and often showing prickles between the cells. Prickles may be traced as delicate lines passing into cells, and ending at the nucleus or vacuole.

ADENOMA.

L.P. Spaces varying in size, generally resembling the arrangement and form of spaces in the gland from which the tumour grows.

Lining of columnar or cubical cells.

Walls of spaces—fibrous or myxomatous tissue, variable in amount, with blood-vessels.

H.P. Contents of spaces—nil, mucus, sebaceous material, &c.

Epithelium—usually in one or two rows, frequently placed upon a layer of flat cells, but not as a rule showing a basement membrane.

Oblique section—polygonal cells filling spaces.

Walls and tissue between spaces—fibrous tissue, often very cellular; myxomatous tissue.

Blood vessels with fully formed walls, outer coat often cellular, and merging into general tissue.

DEGENERATIONS.

PRACTICAL PATHOLOGY.

COMPOUND CYSTIC OVARIAN TUMOUR.

L.P. Large spaces, with tongue-like projections from walls. Contents (if present in section)—homogeneous mucoid or colloid material, frequently containing granular débris.

Lining membrane—columnar cells, usually very clear at their free borders.

Walls of spaces—fibrous tissue, containing blood vessels.

H.P. Contents of spaces—homogeneous material, containing a few degenerated cells.

Epithelium—columnar nucleated cells ; numerous goblet cells, very little protoplasm, nucleus near attached border.

Transverse section through outer portion of epithelium gives a honeycomb appearance.

Tongue-like projections into cysts have a central core of fibrous tissue, and are covered by the same epithelium as the rest of cyst.

ANGIOMA.

L.P. Irregular or rounded spaces filled with blood corpuscles.

Occasional groups of nucleated round cells in the spaces—leucocytes.

Walls of spaces, bands of fibrous tissue, either delicate or thick.

H.P. Spaces contain red blood corpuscles, and here and there may be groups of leucocytes.

Lining of spaces—endothelial cells in a single flat layer.

Walls fibro-cellular or dense fibrous tissue.

DEGENERATIONS.

Calcification—of stroma.

Coagulation—with "organisation" of thrombus.

Œdema—of stroma.

SMALL SPINDLE CELL SARCOMA.

L.P. Small nucleated spindle or oval cells closely packed, and showing a tendency to arrange themselves into bundles, which on transverse section have a dotted or round-cell appearance.

Blood channels—fewer than in round cell sarcoma.

Original tissue of the part.

H.P. Cells in bundles cut in various angles.

1. Longitudinal.

   Oval or spindle shape, or branched at their ends.

   Nuclei—oval.

   Protoplasm—faintly granular.

2. Oblique.

   Short oval shape, varying in size.

   Nuclei—short oval, not seen in all cells.

3. Transverse.

   Round cells varying in size.

   Round nuclei, not seen in all cells.

True round cells are also present in parts.

Intercellular substance very variable in amount, usually fibrillar and parallel to long axes of cells.

Blood channel walls—one or two layers of cells which look spindle-shaped on section.

DEGENERATIONS.

As in round cell sarcoma, but hæmorrhage less frequent, and myxomatous more common.

ADVANCE IN TYPE.

Fibrous tissue, cartilage, bone, &c., seen in mixed forms.

PRACTICAL PATHOLOGY.

SMALL ROUND CELL SARCOMA.

L.P. Small round deeply-stained cells.

Small openings with indefinite walls—blood-vessels.

Blood corpuscles or blood pigment, indicating hæmorrhage.

Portions of original tissue, into which the tumour cells have grown.

H.P. Small round cells, closely packed, with

large nuclei.

small amount of protoplasm.

Intercellular material—very small in amount, or at most a very delicate and scanty fibrillar appearance.

Blood-vessels—1. Channels with undifferentiated walls.

2. „ „ a lining of flattened cells placed end to end.

Hæmorrhages—Blood corpuscles intermingled with the cells of the tumour, these latter degenerating and pigmented.

Original tissue—Fibrin filaments usually degenerating, or in the case of connective tissue corpuscles apparently proliferating.

N.B.—If stained with a nuclear stain and mounted in balsam, the protoplasm of cells is almost invisible.

Degenerations.

Fatty—Fine fatty particles in cells, or free after destruction of cells.

Myxomatous.

Serous or œdematous infiltration.

Hæmorrhages—As above.

PRACTICAL PATHOLOGY.

SCIRRHOUS CANCER.

L.P. Trabeculæ of fibrous tissue in various stages of formation, and enclosing spaces more or less irregular in shape, generally elongated, and containing granular cells.

Oldest parts.

Dense fibrous tissue.
Small spaces.
Fatty cells or fatty débris in spaces.
(Degenerating elastic fibres of ducts when in mamma.)

Fully formed parts.

Fully formed fibrous tissue.
Few blood-vessels.
Spaces completely filled by granular nucleated cells.

Advancing margins.

Original tissue.
Small celled tissue.
Vascularity.

H.P. *Fully formed parts.*

Fibres of fibrous tissue, few connective tissue corpuscles.
Very few blood-vessels.
Contents of spaces or alveoli—
Epithelial cells, large size, irregular in shape.
granular.
large nuclei.

Advancing margins.

Original tissue of part.
Very numerous young connective tissue corpuscles.
Irregular clumps of epithelial cells, some showing division of nuclei.
Increased vascularity.

Central old part of tumour.

Very dense fibrous tissue.
Alveoli, small, and contain fatty débris, or degenerating epithelial cells.
Very slight vascularity.
(In mamma, usually degenerating elastic tissue of ducts to be seen.)

MYELOID SARCOMA.

L.P. Nucleated spindle or irregular-shaped cells, often loosely packed.

Large irregular cells, with several nuclei.

Calcareous spicules.

Blood channels.

Original tissue—usually bone, fibrous tissue, or fat.

H.P. Cells—spindle, irregular, larger, and with more protoplasm than those of small spindle-cell sarcoma.

Nuclei—oval or rounded.

Giant cells—large, irregular, granular cells, containing ovoid or round nuclei.

Intercellular material, delicate fibrils.

Blood channels as in spindle-cell sarcoma.

Calcareous crystals and granules.

Original tissue.

DEGENERATIONS.

Hæmorrhage—Blood corpuscles, or pigment in and between the cells.

Calcification—Granules or crystals in the cells, and in the intercellular substance.

Fatty—As in other tumours (often extensive).

Myxomatous—As in other sarcomata.

ADVANCE IN TYPE.

Fibrous tissue, cartilage, bone spicules.

MELANOTIC SARCOMA.

L.P. Patches or bands of tissue of a brown granular appearance, the rest of the tissue not pigmented, or only very slightly.

Rounded areas very cellular, separated by more or less fibrous bands.

Blood vessels numerous.

Original tissue.

H.P. Cells of various shapes and sizes, often large, with large nuclei and nucleoli, and in parts the cells contain a golden-brown granular pigment, often distending the cell.

Intercellular substance often abundant, fibrillar, and with pigment between fibrillæ ; delicate fibrils may pass between each cell.

Blood channels as in other sarcomata in the cellular parts, but well supported by fibres in some parts ; sometimes distinct perivascular spaces, in which are pigmented cells.

Free granular pigment.

PRACTICAL PATHOLOGY.

ENCEPHALOID CANCER.

L.P. Large, somewhat rounded spaces.

Cellular fibrous tissue surrounding spaces.

Granular cells nucleated.

Patches of degeneration sometimes occupying the centres of alveoli, or in small scattered points.

Blood vessels thin walled, and frequently engorged.

Hæmorrhages (occasional).

H.P. Delicate fibrils, with numerous connective tissue corpuscles, in various stages of growth, surrounding alveoli.

Blood vessels and capillaries with young, cellular walls.

Epithelial cells sometimes columnar or cubical at margins, irregular, and closely packed in alveoli, protoplasm large in amount, granular, large nuclei, division of nuclei.

Degenerations in Epithelial Cells.

Fatty droplets.

Colloid droplets.

Degeneration in Stroma.

Myxomatous.

PRACTICAL PATHOLOGY.

COLLOID CANCER.

L.P. Indefinite rounded areas of clear material containing granules, and surrounded by a slight fibrous stroma, loose in texture, and only slightly cellular.

Less advanced portions—round areas of cells surrounded by fibrous tissue—staining imperfect.

Blood-vessels few in number (in the stroma).

H.P. Clear, translucent material, in which are granules of highly refractile character, free, or distending degenerating cells, whose nuclei are indistinct.

Cells, few in number, and showing clear, refractile granules, may fill a few of the spaces.

Stroma—fibrous, becoming myxomatous, or the fibres separated by œdema, or by colloid material derived from the alveoli.

Blood vessels—firm walls in fibrous stroma.

ADENOID CANCER or MALIGNANT ADENOMA.

L.P. Small, irregular spaces, usually empty.
Walls cellular, with a few delicate fibrils.
Lining membrane—columnar (rarely cubical) epithelial cells.
Blood vessels—small, numerous, cellular walls.

H.P. Small clear spaces, empty, or containing a little mucus.
Lining membrane—
Cells—columnar (rarely cubical), in one or more layers, with growing cells between and beneath.
Chalice cells variable in number (rare).
No basement membrane.
Stroma—small nucleated cells with delicate fibrils or bands of young fibrous tissue.
Blood vessels—cellular walls, badly supported.

Degenerations.

Hæmorrhage—Common, with ulceration.

In Lining Cells.

Mucous—Chalice cells numerous, spaces larger.
Colloid—As in colloid cancer.

In Stroma.

Myxomatous.

SQUAMOUS EPITHELIOMA.

L.P. Central Superficial Part of Tumour.

Compact nucleated tissue, degenerated (horny) on surface and in rounded knots, the latter with concentric lamination (cell nests).

No vascular supply.

Marginal and Infiltrating Parts.

Subcutaneous tissues separated by masses of round nucleated cells, resembling granulation tissue.

Club-shaped or dendritic masses of compact cellular tissue, some showing cell nests; these masses have the smallest cells and most evident nucleation at their outer margins, where they are in contact with the granulation tissue.

Blood-vessels variable in size and number.

H.P. Epithelial tissue in rounded or cylindrical masses embedded in granulation tissue, in which are the remains of infiltrated normal tissue.

Each epithelial mass shows—

Germinal cells at the circumference.

Polygonal cells filling up the central part, or becoming flat and slightly curved towards the surface, and by their number forming a central knot; these central cells may be similar to the horny layer, or contain colloid material—(cell nests).

Granulation tissue consists of small round nucleated cells and capillary blood-vessels.

Connective tissue corpuscles of the infiltrated tissue show proliferation.

Neighbouring Rete Malpighii shows increased cell formation, especially in the interpapillary portions.

Degenerations.

Colloid—See colloid cancer.

Ulceration—Hyperæmic deep tissue, granular surface composed of epithelial cells, often vacuolated.

LIVER.—FATTY DEGENERATION.

L.P. Rows of liver cells shrunken, and with irregular outlines, containing minute fatty particles.

Diameter of capillaries variable according to co-existent lesion.

May affect any or all zones of lobules.

H.P. Liver cells angular, irregular, and smaller.

Nucleus not pushed to one side.

Cells contain small fatty particles, which do not as a rule coalesce, but may in acute forms (*e.g.*, phosphorus poisoning).

Associated Lesions.

Fatty infiltration.

Cloudy swelling.

Waxy degeneration.

LIVER.—CLOUDY SWELLING.

L.P. Peripheral zones of the lobules appear denser and more opaque than normal.

Diminished proportional area occupied by the capillary network.

Indefinite and variable reactions of ordinary staining solutions.

In an extreme degree—

Extension of the above changes towards the centres of the lobules.

Presence of small round nucleated cells in portal spaces.

H.P. Polyhedral liver cells have become globular and swollen, and the outlines of contiguous cells difficult to discern.

Capillaries compressed, sometimes invisible.

Liver cells show

Increased granularity.

Weak staining of the nucleus (occasionally a few nuclei may stain very brilliantly).

Small clear spherical areas (vacuolation) in the cells, not reacting with osmic acid.

Small round nucleated cells (leucocytes) in portal spaces, between fibrous filaments of Glisson's capsule.

Resulting Changes.

Molecular disintegration.

Fatty degeneration.

Increased connective tissue in Glisson's capsule.

LIVER.—FATTY INFILTRATION.

L.P. Dark outline of lobules on altering focus.

Rounded highly refracting particles of different sizes in the liver cells.

(α) *Early.*

In the liver cells adjoining the small branches of Glisson's capsule, and therefore only present in part of the peripheral zone of each liver lobule.

The change gradually extends to the whole circumference of the lobule.

(β) *Moderately advanced.*

Extension of the change to the intermediate zone.

Distended liver cells appear to compress the capillaries in the outer zone.

(γ) *Advanced.*

Extension to central zone, and increase in fatty deposit, and in size of droplets.

Apparent compression of capillaries and central veins, absence of evidence of vascularity in the former.

H.P. (α and β.)

Liver cells contain highly refractive globules of fat which have coalesced in some cells, forming a large globule which displaces the protoplasm and nucleus.

Decrease in protoplasm.

Increase in size of cells.

Diminished space occupied by capillaries.

(γ) Close resemblance of liver tissue to adipose tissue, but the cells are smaller than in the latter.

Indistinct outlines of cells.

For "highly refracting" read "stained black" if the section have been treated with osmic acid.

The refractive, clear, or faint yellow appearance persists under ordinary staining.

Fatty matter is dissolved, or has its refractive character destroyed by mounting in balsam solution whose refractive index is nearly the same.

Very thin sections of fatty cells often fail to show refraction owing to rupture of the cell membrane and escape of the contained fat, which may, however, adhere in part to the concavity of the space.

Associated lesions.—Any lesion other than some of the more acute forms of degeneration.

PRACTICAL PATHOLOGY.

LIVER—WAXY DEGENERATION.

L.P.

Early.—Translucent appearance of intermediate zones of lobules, broken by fine granular lines and dots (atrophying liver cells.)
Shining and thickened middle coats of hepatic artery.

Advanced.

Translucent character of section is present in intermediate, portal, and if very advanced, in central zones of lobules, leaving only slight evidence of granular cell elements.
Shining thick walls of hepatic arterioles.
Shining points on walls of portal, and occasionally sublobular veins.

H.P.

Early.

Liver Cells.—Angular, compressed, granular, nucleated.

Capillaries.—Walls—thick, translucent.

Arterioles in portal spaces.—Middle coat clear, swollen, not cellular.

Advanced.

Increase of thickness in arterioles ; and in capillaries of outer, intermediate and extending to inner zones.

Liver Cells.—Completely atrophied, or in some stage of degeneration.

Veins.—Fibres swollen and clear in some of larger portal and hepatic branches.
Pigment in central zone (occasional.)

Associated Lesions.

Tuberculosis.-- See tubercle of liver.

Syphilitic gummata.—Caseated areas with dense fibro-cellular capsule.

Fatty —Infiltration in outer zones.
Degeneration in all zones.

STAINED IN—1. Methyl-aniline violet.
For "translucent," or "shining," read "rose-pink homogeneous."
Other tissues blue or purple.

2. Iodine.
For "translucent," "shining," read "mahogany brown by reflected light," brownish yellow by transmitted light.
Other tissues light yellow.

3. Picrocarmine.
For "translucent," "shining," read "orange" or "lemon coloured."
Other tissues as in other sections.

LIVER—CHRONIC VENOUS CONGESTION (NUTMEG.)

L.P.

Early. Central zones of lobules show pigment in the liver cells.

Central venule dilated ; sub-lobular veins enlarged.

Capillaries of central zone dilated.

Advanced.

Islets of liver cells containing portal spaces, and thus being composed of parts of outer zones of two or three lobules.

Remainder of zones of lobules like delicate lace, sometimes much pigmented, the meshes being dilated capillaries and central veins.

H.P.

Early. *Central veins and sub-lobular veins:*
Dilated.

Capillaries in central zones:
Dilated.

Liver cells:
Atrophying and containing granules of deep orange or brown pigment ; may be fatty in outer zone.

Advanced.

Veins.—Much dilated, fibrous thickening of walls.

Capillaries—Much dilated throughout lobule except in the areas surrounding portal spaces.

Pigment between the apposed walls of neighbouring capillaries.

Liver Cells.—Absent in many parts ; where present often compressed, granular, bile-stained or fatty.

LIVER—CIRRHOSIS.

L.P. Fibrous tissue dividing the liver into groups of two or more lobules (common cirrhosis), or passing between individual lobules (fine cirrhosis) or irregular in distribution (diffuse).

Fibrous bands—dense, but usually contain areas of more recent formation (small celled).

Situation—formed by increase in Glisson's capsule ; therefore contain sections of portal veins, bile ducts, &c.

Liver cells—closely packed, outlines of lobules in common and diffuse cirrhosis indistinct.

H.P. Fibrous bands in all stages of growth, spreading in all cases through parts of lobules, and causing atrophy of included liver cells.

Young capillary formation.

Thickening of walls of capillaries in diffuse form.

Liver cells closely packed with diminished capillary spaces.

Isolated groups of two or three atrophying liver cells in the fibrous bands.

In diffuse cirrhosis individual liver cells often separated by delicate bands of fibrous tissue, though parts are normal.

Associated Lesions.

Fatty Infiltration—may be only in cells along margins of fibrous band, or general.

Fatty Degeneration—q. v.

Pigmentation—Usually bile pigment.

LIVER—ACUTE YELLOW ATROPHY.

L.P. Liver tissue.

Granular, swollen cells, do not react well to ordinary stains.

Loss of radiate arrangement of lobules.

Portal spaces very distinct.

Great infiltration of small round cells.

Bile ducts and bile capillaries prominent features.

Where liver cells have been destroyed.

Diminished size of lobule, but form retained.

Capillaries distended with blood.

Hæmorrhages.

H.P. Liver cells—have entirely disappeared in many parts.

Where present in groups are swollen, granular, nuclei do not stain.

May be undergoing molecular disintegration and absorption.

Capillaries of lobule filled with blood corpuscles, and crowded together.

Portal spaces.

Great numbers of small round nucleated cells separating the bile ducts and vessels.

Bile ducts—lumen diminished ? Epithelium swollen. Smaller bile ducts increased in number.

Portal vein branches normal.

Capillaries and veins engorged with blood corpuscles.

Hæmorrhages.

In fresh tissue.

Crystals of Leucin and Tyrosin.

LIVER—LEUCOCYTHÆMIA.

L.P.

Early.

Numerous masses composed of brightly stained points, most evident in portal spaces and fissures, and to a slight extent between liver cells.

Advanced.

Lobules appear composed of brightly stained nuclei, still showing the radial arrangement; narrow lines, more faintly stained, broken into short lengths between the brightly stained cells.

Portal spaces as in early stage, but larger owing to greater leucocyte infiltration.

H.P.

Early.

Brightly stained round nucleated cells separating the connective tissue fibrils of the portal spaces, and in smaller number occupying the capillaries within the lobule.

Advanced.

Distended capillaries containing brightly stained leucocytes.

Compressed and atrophied liver cells, whose nuclei may stain very feebly.

Red blood corpuscles variable in number.

Hæmorrhages—composed of leucocytes and red blood corpuscles, liver structure destroyed.

LIVER—ACUTE TUBERCULOSIS.

N.E. Small roundish translucent or opaque points; which stain deeply.

L.P. Scattered nodules ("tubercle granulations"), irregularly rounded, often formed by confluence of several smaller nodules ("elementary tubercles" or "tubercle follicles").

Granulations are of various size, but rarely exceed $\frac{1}{3}$ diam. of lobule.

Situation—in or close to portal spaces, or beneath capsule.

Staining—smaller, usually deeply stained throughout; larger (composed of several confluent nodules), each nodule may be pale, granular (caseous) or hyaline in centre, deeply stained at margin. Peculiar wrinkled translucent appearance frequent in central parts.

One or more very large, pale, multinucleated cells ("giant cells") may be seen in each nodule.

Nodules non-vascular.

H.P. *Of Tubercle Follicle.*

(α) Small, round, nucleated cells, most closely packed at periphery.

(β) Delicate fibrillar substance, circularly disposed.

(γ) A very large cell ("Giant cell"), often central, with or without processes, and containing numerous nuclei, often peripheral.

(δ) Large cells, with one or two nuclei, sometimes adjoin giant cell (endothelioid cells).

Or γ and δ may be replaced by hyaline, glassy, or by structureless granular material.

Liver tissue round nodules may show congestion, but otherwise normal.

SPLEEN—TUBERCLE.

L.P. *Large nodules* made up of several smaller rounded masses, structureless and granular in the centre, with a hyaline zone surrounding this, and external to these a fibrous looking zone, in which giant cells may be seen.

Small nodules, which may be granular or hyaline in the centre, or may resemble an area of very closely packed nuclei, with or without a giant cell.

Situation—1. Most commonly in the Malpighian bodies, though extending to pulp.
2. Starting in pulp, and trabeculæ less common.

H.P. The tubercular masses are not vascular.

Central parts may be finely granular and structureless, or hyaline.

Hyaline areas may be radial in arrangement, are clear and structureless, formed by swelling and fusion of cells and fibrils.

Small round nucleated cells, having much the same appearance as lymph corpuscles of the spleen, but more densely packed, and without vascular supply—often arranged round a giant cell ; and endothelioid cells.

In large nodules, a fibro-cellular zone, infiltrated with lymphoid cells and giant cells, may be seen round the central parts.

General splenic tissue usually congested.

SPLEEN—CONGESTION.

A. Acute Congestion (Active Hyperæmia).

L.P.

Malpighian bodies pale, distinct.
Zone of engorgement surrounds the Malpighian bodies, gradually diminishing towards pulp.
Presence of a few brilliantly stained points in congested zone.
Swelling, irregular, of central artery in some cases (Hyaline).
Pulp congested.
Hæmorrhages may be present.

H.P. Engorgement of capillaries and pulp spaces at margin of Malpighian bodies.
Hyaline swelling of media or intima of arteries may be present.
Hyaline swelling and fusion of lymph corpuscles.
General congestion of vascular spaces in pulp.

B. Chronic Venous Congestion (Passive Hyperæmia).

L.P.

Dilatation of veins, and of venous sinuses, latter especially towards surface.
Diffuse slight pigmentation, with or without the appearance of much blood.
Diminution in cellular elements, section more fibrous in appearance, or fenestrated.
Malpighian bodies variable in size, often smaller and less cellular.
Trabeculæ very distinct, and may be thickened. Capsule also thickened.

H.P. Dilatation of venous sinuses by red blood corpuscles, with swelling of their endothelium.
Lymph corpuscles comparatively scanty, and pulp generally atrophied between the dilated venous sinuses.
Pigmentation may be seen in

1. Endothelium.
2. Adenoid reticulum of Malpighian body and pulp.
3. Trabeculæ.

Fibroid appearance of Malpighian bodies (occasionally).

SPLEEN—WAXY.

B. "Diffuse" Form.

L.P. General pulp translucent, less cellular than normal, and may have fenestrated appearance, if, as is usual, distension of vascular sinuses co-exists.

Trabeculæ unaffected.

Malpighian bodies cellular at periphery and round central arteriole, this latter usually shining and swollen.

In advanced conditions waxy degeneration is seen commencing in the Malpighian bodies, midway between the central arteriole and the periphery.

H.P.

(α.) *Pulp.*

Walls of vascular sinuses swollen and waxy.

Endothelium and contained blood unaffected.

Arterioles—waxy middle coats.

Trabeculæ unaffected, elastic tissue unaffected.

Adenoid reticulum waxy.

Lymph corpuscles very scanty.

(β.) *Malpighian Body.*

Lymph corpuscles—fewer in number than normal, and not waxy.

Adenoid reticulum and capillary walls—not waxy, or only slightly, as mentioned under L.P.

Central arteriole—waxy middle coat (in most cases).

N.B.—For staining reactions *see* Waxy Liver.

PRACTICAL PATHOLOGY.

SPLEEN—WAXY.

A. "Sago" Form.

N.E. Translucent rounded or branching areas (redder than rest if stained with methyl-violet).

L.P. Translucent rounded masses, intersected by faint lines (Malpighian bodies).

In centre of each, an arteriole with area of unaltered lymphoid tissue immediately around it.

Arteriole waxy, or if at all large, frequently unaffected.

Trabeculæ unaffected.

Arterioles in pulp swollen and shining.

General pulp tissue wasted (few cells), often congested.

H.P. (α.) *Malpighian body.*

Capillary walls and reticulum of adenoid tissue waxy, except in part immediately around artery. Waxy change may extend into surrounding pulp.

Arteriole—Middle coat waxy—or unaffected.

Endothelium unaffected.

(β.) *Pulp.*

Some arterioles, with waxy middle coat.

General pulp tissue usually not waxy, except some filiments of connective tissue here and there.

Trabeculæ normal.

Vascular sinuses may be dilated.

For staining reactions, *see* Waxy Liver.

ARTERIES—ENDARTERITIS DEFORMANS.

AORTA.

L.P. *Inner Coat* often convex in section, and shews one or more thickenings (patches of Endarteritis).

A thickening may have—1. Blood clot adhering to it.

2. Hyaline patches (more deeply stained).

3. Lamellar fibrous appearance with—
   - (α) Many nuclei or almost none.
   - (β) Large spaces containing calcareous or granular débris.
   - (γ) Capillaries and cells growing into the deeper parts from middle coat.

Middle Coat—1. Unaffected.

2. Granular.

3. Showing increased vascular supply surrounded by many nuclei.

Outer Coat—1. Capillaries engorged with blood.

2. Increase of cells (leucocytes chiefly) especially around vessels.

H.P.

Inner Coat—

Thickened part (examining from lumen outwards.)

1. Endothelium (not usually present in sections.)
2. Fibrils arranged in parallel layers. May be hyaline and swollen.
3. Cells sometimes numerous in fusiform spaces between fibrils.
4. Cells fewer in number, fibres thicker.
5. Granules in cells and fibres, stain faintly.
6. Large spaces containing fatty and calcareous débris.
7. Capillaries and small cells invading from middle coat.

Middle Coat—

1. Unaffected.
2. Granules replace muscular elements, and the elastic laminæ are much broken.
3. New capillaries and granulation tissue.

Outer Coat—as under L.P.

PRACTICAL PATHOLOGY.

ARTERIES—ENDARTERITIS DEFORMANS.

SMALL ARTERY (*e.g.* Cerebral).

N.E. Unequal thickness of vessel—often signet-ring appearance.

L.P. Thickening of inner coat, laminated, fibrous looking, with a few nuclei—not uniformly around vessel.
Granules or small spaces in outer part of thickened inner coat.
Internal elastic lamina intact, except in very advanced cases.
Muscular coat intact; in advanced cases may shew increase of nuclei, or granular degeneration.

H.P.

INNER COAT (enormously thickened in diseased part).

Endothelial layer—flat spindle-shaped nuclei on section.
Beneath endothelium are very numerous fibrous laminæ, enclosing spaces which are fusiform in section.
Spaces contain nucleated cells, several in each space.

Further from lumen—
Spaces larger.
Cells degenerating, fatty or granular.
Fatty débris.
Calcareous particles (may be crystals) in spaces and in the fibres.

INTERNAL ELASTIC LAMINA—1. Intact.
2. Broken into short pieces, these may be slightly thickened at the fractured ends.

MUSCULAR COAT—1. May be unaffected.
2. Presence of small round nucleated cells.
3. Imperfect staining, granules replace the muscular fibres.

OUTER COAT—Usually unaffected.

HEART. FATTY DEGENERATION.

Stained in Osmic Acid.

L.P. Observe bundles of fibres, some cut across, others lengthwise; and bundles of connective tissue with groups of fat cells here and there (normal.)

Ill defined patches shewing muscular bundles containing small black dots.

Situation—In wall near endocardium, or may be general.

Nuclei of part affected—indistinct or invisible, with ordinary staining fluids.

H.P. Look for fibres cut lengthwise.

Fibres may be slightly swollen, of normal size, or atrophied.

Outline of muscular elements often indistinct.

Striation lost or impaired in some fibres.

Nucleus invisible or very indistinct.

Presence of minute granules and fatty particles in the contractile elements, affecting groups of fibres.

Fatty particles in early stages *arranged in rows along the fibrils.* Some of particles do not stain with osmic acid.

Complete destruction of fibres and their replacement by fatty droplets in advanced stages.

Associated Lesions.

Cloudy swelling.

HEART. FATTY INFILTRATION—ADIPOSITY.

L.P. Epicardium of greater thickness than normal. Deep layer composed almost entirely of adipose tissue, which also passes into the heart-wall along connective tissue planes surrounding the blood vessels.

Muscular tissue separated here and there by collections of fat cells, among which are to be seen small branches of the coronary vessels.

H.P. Deep layer of epicardium and inter-muscular septa consist, for the most part, of adipose tissue.

A few fat cells may be seen between some of the fibres.

The muscular fibres not affected.

Associated Lesions.

Fatty degeneration.—Common.

Cloudy swelling.

Brown atrophy.

HEART—BROWN ATROPHY.

L.P. May appear—1. Normal.

2. Fibres small, spaces larger than normal, and dark brown points resembling nuclei in fibres.

H.P. Fibres in longitudinal section—

Striation (transverse and longitudinal) unaltered, or even more evident.

Yellow granules in the fibres grouped round and obscuring the nuclei of the muscle corpuscles, chiefly at the poles of the oval nuclei.

In advanced conditions—

Granules of pigment in lines following longitudinal striation.

Fibres in transverse section—

Central nucleus with yellow pigment granules round.

N.B.—Fibres cut across, above or below nucleus, may not shew pigment.

Associated Lesion.

Fatty Degeneration.

HEART. CLOUDY SWELLING.

L.P. Muscular fibres more closely packed, and inter-muscular spaces diminished.

Opacity of fibres, best marked under epicardium.

Slight increase of cells in epicardium and around small vessels.

H.P. Muscular fibres—Swollen.

Finely granular.

Loss of striation.

Nuclei obscured—a few may be very brilliantly stained.

In severe advanced conditions—hyaline degeneration of fibres.

Clear, semi-translucent, faintly stained.

Swollen.

May shew transverse lines of fracture.

Inter-muscular spaces much diminished in size, or may contain a few leucocytes.

Associated Lesion.

Fatty degeneration in severe conditions.

HEART—PERICARDITIS (Organising).
LUNG—PLEURISY.

N.E. Thick layer of pale colour with opaque margin, at one side of the section.

L.P. Deeply stained material ("coagulated lymph," "fibrin") at free margin. This may be—

1. Irregular in outline.
2. Homogeneous.
3. Faintly stratified, or in loose whorls.

Very numerous small round cells, forming a basis on which fibrin rests, and visible in some parts of the fibrin.

Loose cellular tissue, in which may be traced—

1. A faint line parallel with the edge of the section (original line between superficial and deep layers of epicardium).
2. Lines formed by rows of nuclei passing from deep layer to edge of fibrin (young capillaries).
3. Connective tissue of epicardium separated by nucleated cells, etc.
4. Engorged vessels in the deep layer surrounded by leucocytes.

Muscular tissue—As in cloudy swelling, but usually more vascular engorgement and leucocyte exudation in intermuscular spaces.

H.P. Fibrin—Structureless homogeneous material, or filamentous and granular, in some parts loosely arranged, and may contain leucocytes and a few large nucleated cells (endothelial). No definite arrangement.

Cellular elements—

1. Small round nucleated cells (leucocytes).
2. Connective tissue corpuscles in various stages of development in fibrous tissue growth; long axes of cells for the most part parallel with epicardial surface.

Young capillaries—As vascular loops reaching up to and into fibrin, at right angles to epicardial surface, formed of flat nucleated cells (spindle-shaped in section) in single or double rows on each side. Budding of young capillaries.

Vessels in deep layer engorged, and shewing leucocytes around the smaller branches.

Fat cells in deep layer becoming absorbed (may be seen).

Muscular tissue—As in cloudy swelling and L.P.

In Pleurisy the above changes are found by allowing for the following structural differences:—

For "epicardium" or "epicardial surface," read "pleura" or "pleural surface."

For "muscular tissue," read "alveoli."

For "intermuscular spaces," read "interalveolar and interlobular septa.

For "cloudy swelling," read "acute congestion" or "pneumonia" in lung.

For "fat cells, etc." read "carbon pigment present in the deep layer.

PRACTICAL PATHOLOGY.

LUNG.

In the description of lung sections, A, "supporting framework," will include the connective tissue of—

1. "Deep layer of Pleura."
2. "Interlobular septa."
3. "Peribronchial and perivascular tissue."
4. "Interalveolar septa."

B, "air spaces," will include—

1. "Terminal bronchioles," and "alveolar ducts and passages."
2. "Infundibula."
3. "Alveoli," or "air cells."

but not the lumina of bronchi.

C, "Consolidation," will refer to the appearance in section of loss of air space, whether by—

1. "Hæmorrhage."
2. "Exudation of coagulated fluid."
3. "Blocking by catarrhal cells."
4. "Collapse" (*e.g.* approximation of walls of air spaces.)
5. "Growths" (*e.g.* tubercular, &c.).
6. Thickening of alveolar walls by growth of connective tissue, and consequent partial obliteration of air spaces.

LUNG. ACUTE CONGESTION.

L.P. Supporting framework thicker. Beading of interalveolar septa. } due to { 1. Distended capillaries. 2. Slight effusion.

Some air cells consolidated by effusion or hæmorrhage.

H.P. Capillaries of supporting framework engorged, and bulging into air spaces.

Swelling of flat epithelial lining cells ; some may be proliferated, and appear as large round granular cells, with large ovoid nuclei (catarrhal cells).

Effusion (if present) clear, homogeneous, or fibrillar, and only found in scattered areas, partly or entirely filling one or two air spaces.

Oedema of interlobular septa (in extreme congestion).

Areas of consolidation by hæmorrhage (red blood corpuscles filling alveoli).

Early pleurisy may be present.

Capillaries derived from bronchial artery may or may not be engorged.

LUNG. ACUTE LOBAR PNEUMONIA.

GREY HEPATIZATION STAGE.

L.P. Consolidation diminishing ; as evidenced by retraction of effused material from walls of air spaces, leaving clear margins ; variable in amount in different parts of the section.

Vascularity variable—may be, 1. Normal.
2. Increased.
3. Entirely wanting in parts.

Pleurisy—may be organizing.

Bronchial capillaries engorged, mucous membrane swollen.

Supporting framework—1. Œdematous.
2. Cellular increase.
3. Congested.

H.P. Walls of air spaces—1. Vascularity variable, as under L.P.
2. Lining epithelium absent in parts and proliferating in others.

Contents of air spaces—

1. Granular opaque fibrin (usually deeply stained).
2. Leucocytes (numerous) degenerating.
3. Catarrhal cells (often numerous and degenerating).

Bronchi—Bronchitis q. v.

Supporting framework—1. Cellular increase leading to fibrous tissue formation.
2. Separation of fibres, &c., by œdema.
3. Congestion of interlobular septa.

LUNG. ACUTE LOBAR PNEUMONIA.

Red Hepatization Stage.

L.P. Complete consolidation by effusion of lymph, or effusion of lymph, blood and cells, in varying proportions, into the air spaces.

Variable vascularity of supporting framework ; often slight.

Early pleurisy (*e.g.* fibrin on surface, no organization.)

Bronchial capillaries usually engorged.

H.P. Walls of air spaces.—1. Often appear compressed and non-vascular ; or,

2. Slightly vascular.
3. Lining epithelium invisible or swollen, and proliferating slightly.

Contents of air spaces—

1. Fibrin filaments and granules.
2. Leucocytes (often very numerous).
3. Red blood corpuscles (variable in number, may be absent).
4. Catarrhal cells (few in number) ; or
5. Hæmorrhagic areas.

Bronchi—Bronchitis q. v.

Deep layer of pleura and interlobular septa may be œdematous, and shew leucocytes between fibrils.

LUNG. HYPOSTATIC PNEUMONIA.

Numerous forms of consolidation, varying chiefly in extent of areas filled with cellular and coagulable material. (Fluid, non-coagulable, exudation into air spaces not being recognisable in sections.)

L.P. Lobular areas of consolidation (fibrinous and cellular).

Intervening lobules generally show changes similar in character but less intense.

Air cells adjoining interlobular septa and peribronchial tissue most markedly consolidated (often by fibrinous exudation).

Supporting framework shows—1. Engorgement of capillaries and veins.

2. Œdema.

Pleura—No pleurisy (as a rule).

Bronchi—Bronchitis.—Cellular plugs.

Pulmonary arteries—Engorged.—Thrombosis ?

H.P. Air spaces contain—1. Fibrin filaments, few or abundant.

2. Catarrhal cells usually numerous, and may be the only contents.

3. Leucocytes.

4. Red blood corpuscles (hæmorrhage).

N.B.—The plugs are usually looser in texture and contain more catarrhal cells than in acute lobar pneumonia.

Air spaces empty, or with very slight changes, as above.

Interalveolar septa—Capillaries engorged (usually).

Lining epithelium swollen, proliferating.

Supporting framework as under L.P.

Bronchi—Bronchitis—plugs of catarrhal cells and exudation products.

Pulmonary arteries—Engorged.—Thrombi ?

Carbon pigment is commonly present in lymphatics and catarrhal cells.

LUNG. CATARRHAL OR LOBULAR PNEUMONIA.

L.P. Consolidation of patches, indefinite or sharply defined, and bounded by interlobular septa, consisting of several adjoining or scattered single lobules.

Surrounding lobules—1. Normal or congested.
2. Emphysematous.

Consolidation may be—1. Collapse and congestion (early).
2. Cellular material filling or distending the air spaces.
3. Small amount of fibrinous exudation (generally surrounding bronchus and artery).

Lobular { Bronchus—Blocked by plug of mucus and cells.
Artery—May contain thrombus.

H.P. Air spaces of consolidated portions—

1. Collapsed, walls congested, swollen epithelial lining.
2. Proliferated epithelial cells (large, round, nucleated).
3. A few fibrin filaments (not always present).
4. Leucocytes in air spaces and framework of the consolidated area.

Surrounding air spaces—1. Emphysematous.
2. Congested.
3. Normal.

Lobular { Bronchus.—1. Cellular increase in walls; 2. Bronchitis; 3. Plugging by mucus and cells.
Artery.—1. Engorged with red blood corpuscles.
2. Thrombus (*i.e.*, clot).

LUNG. BRONCHITIS—ACUTE.

Large and Medium Sized Bronchi.

L.P. *Mucous membrane* swollen and congested.

Distinct *Basement membrane* internal to which may be noticed—

1. Absence of epithelium ; or,
2. Dotted and jagged lining in patches.
3. Plug of mucus and granules in the smaller bronchi.

Peribronchial tissue—1. Congested.
2. Great cellular increase, extending to the walls of adjoining air spaces

(Air spaces may be—1. Normal ; or have,
2. Congested walls ; or,
3. Consolidated.)

H.P. Bronchi.—*Lumen*—1. Empty.
2. Containing mucus and catarrhal cells.
3. Invaded by capillaries and leucocytes at the margin.

Epithelium—1. Absent.
2. Proliferating, *e.g.*, round cells, and imperfect, pointed, columnar cells.

Basement membrane—1. Swollen and homogeneous.
2. Ruptured (rare).

Submucosa and peribronchial tissue. { 1. Engorged capillaries. 2. Leucocyte exudation.

Mucous glands increased in size, and their epithelium clearer, due to increased mucus secretion.

Muscular tissue.—Absorption ?

Cartilage.—Softening of matrix rare. Degeneration in cells.

LUNG. INTERSTITIAL PNEUMONIA.

L.P. General increase in amount of supporting framework; most marked in—1. Deep layer of pleura.

2. Interlobular septa.

3. Peribronchial tissue.

Extending from these to the interalveolar septa, and consisting of—1. Fully formed fibrous tissue.

2. Patches composed almost entirely of small cells (granulation tissue).

Air spaces—*Adjoining or in the affected parts.*

1. Small and compressed.
2. Consolidated.
3. Obliterated.

Most distant from affected parts.

1. Normal.
2. Congested.
3. Emphysematous.
4. Consolidated by pneumonia.

Bronchi—Bronchitis—Obliterated.

Arteries—In oldest parts of fibrous increase some are obliterated, internal elastic laminæ of large arteries usually visible.

In advancing parts—Walls thickened, lumen diminished.

H.P. Air spaces in affected parts—1. Obliterated. 2. Very small and compressed, or invaded by granulation tissue.

Supporting framework—All stages of fibrous tissue development causing contraction of air spaces.

Lining epithelium of involved air spaces often cubical and proliferating.

Bronchi—Bronchitis—Peribronchitis.

Arteries—Endarteritis—Cellular increase of intima, becomes fibroid and lumen obliterated.

Periarteritis—Cannot be separated from general fibrous increase.

Internal elastic lamina often persists.

Capillaries—Some obliterated in oldest parts, others engorged throughout, or normal.

LUNG. ANTHRACOSIS—COALMINER'S LUNG.

L.P. Nodules of all sizes, dense, black, scattered through the supporting framework, most marked in deep layer of pleura and at junctions of interlobular septa.

Centres of nodules usually show—1. A bronchus and artery, or,

2. A vein.

3. A fibrous knot.

Slight thickening of general framework.

Pneumonic or catarrhal changes and cavities may be present, but not common in sections from ordinary cases.

Congestion may or may not be present.

H.P. Pigment is granular, intensely black, and situated in—

1. Lymphatics and connective tissue.
2. Catarrhal and swollen epithelial cells.

Air cell walls show proliferative changes and pigment, with or without congestion.

Air spaces—empty—or pneumonic (acute or catarrhal).

Small vessels show obliterative changes—endarteritis (not so marked as in silicosis).

Bronchi—bronchitis.

LUNG. EMPHYSEMA.

L.P. Air spaces much larger than normal, and consist of—

1. Infundibula and alveolar passages over-distended.
2. Infundibula with ruptured walls.
3. Air cells on infundibular walls, stretched.

Interalveolar septa of affected parts.

1. Thin.
2. Smooth.
3. Non-vascular, or only slightly vascular.

H.P. Walls of air spaces.

1. Thin (may show fenestration).
2. Capillaries absent or attenuated, and not containing red blood corpuscles. (May resemble elastic filaments when viewed on surface).
3. Absence of part or all of epithelial lining.

Pulmonary arteries may be impermeable in certain parts, and fibroid, owing to endarteritis obliterans.

Associated Lesions.

Bronchitis.

Patches of—1. Collapse.
2. Catarrhal pneumonia.

LUNG. SILICOSIS—STONEMASON'S LUNG.

L.P. Nodules of dense fibrous tissue in deep layer of pleura, peribronchial, and perivascular tissues and interlobular septa. Abundant nuclei at the margins where extension to the walls of air cells is taking place, as in interstitial pneumonia. Pigment black (or grey, when in small quantity) in the nodules.

The central part of a nodule may show obliterated artery and bronchus, or caseous mass, or may be fibrous.

Air cells frequently pneumonic around nodules.

Interalveolar septa congested.

Newly-formed connective tissue often contains very numerous and large vessels.

H.P. Each nodule usually contains either—

1. A caseous centre.

Or, 2. A fibrous pigmented centre.

Or, 3. An obliterated vessel or bronchus, or changes leading to these—(*e.g.*, endarteritis—bronchitis—plugging, &c.).

Or, 4. A pigmented zone intermediate between the centre and the younger inflammatory margins.

Pigment—1. Carbon or blood-pigment.

2. Fine granules, irregular in size and shape, and often showing a clear central part—(calcareous) seen in lymphatics and catarrhal cells.

Other changes, as in interstitial pneumonia ; endarteritis, pneumonic exudation over larger areas, and caseation being more common.

LUNG. ACUTE TUBERCULOSIS.

A.—Form with very Minute Miliary Granulations.

N.E. Very small rounded areas of consolidation, not usually larger than grains of sand, usually scattered irregularly through section, but may be in clusters. Section otherwise of normal appearance.

L.P. Nodules are chiefly of two kinds :—

I. Small thickenings of septa, or of bronchial or vascular walls, &c., invading and compressing adjoining air spaces. (Growth in lymphatics.)

II. Minute areas of consolidation of lung tissue, each corresponding with one of the minute ultimate terminations of a bronchiole and its corresponding air spaces (as seen in section, one or two infundilula and their alveoli). (Acinous form of tubercular catarrhal process, with interstitial proliferation.)

Centres of nodules frequently indistinct, granular, yellowish, from commencing caseation.

General lung tissue normal or congested.

H.P. I. Nodules consist of a collection of small round nucleated cells growing from connective tissue, and invading neighbouring air cells. A giant cell seen very rarely.

Towards centre nodule usually hyaline or caseous (stains imperfectly).

Surrounding air cells may be—

1. Normal, or with slight proliferation of epithelium.
2. Congested.
3. Pneumonic (fibrinous or catarrhal, usually only slight in amount).

II. Outlines of walls of air cells can be seen in consolidated areas.

Consolidated areas usually show—

Central part granular, or hyaline and amorphous (caseated), only very few nuclei or cells visible.

Outside this a part showing indistinctly outlines of air cells, containing masses of degenerating catarrhal cells or fibrin.

Further out alveoli, with walls and septa infiltrated with small round cells, and containing masses of large irregular catarrhal cells.

Catarrhal cells very fatty or granular.

Capillaries in affected areas obstructed (injection does not pass into).

Giant cells very rarely seen.

General lung tissue usually shows acute congestion.

In sections stained for bacilli.

L.P. Deeply stained granular areas, usually towards centre of areas of consolidation.

Faint diffuse staining of rest of tissues.

H.P. Tubercle-bacilli—very minute rods, straight or bent, deeply stained—seen in masses in central caseated portions, and scattered irregularly through rest of nodules.

Stained with fuchsin—bacilli deep red.

gentian violet—bacilli deep violet.

LUNG. CHRONIC VENOUS CONGESTION.

L.P. Tissue has a generally coarser texture than normal, owing to engorged capillaries of interalveolar and interlobular septa, &c.

Increase of pigment along course of lymphatics.

Pigmentation, usually brown in colour, also seen in some air spaces; may be very small in quantity, or almost completely fill one or two alveoli.

Hæmorrhages into air spaces.

H.P. Interalveolar septa broader (may show beading), due to—

1. Distended capillaries with thick walls (chiefly).
2. Interstitial increase.
3. Pigmentary deposit.

Air spaces may be—

1. Empty.
2. Filled with red blood corpuscles (hæmorrhage).
3. Occupied by a variable number of large round, or irregularly shaped, cells containing brown pigment, and a small quantity of black pigment.

Pigment appears—

1. Black, in large masses (carbon and blood).
2. Brown (from blood), in small quantity, mixed with particles of carbon.

LUNG. ACUTE PHTHISIS.

L.P. Extensive consolidation of air spaces by tubercular broncho-pneumonia, and also fibrinous exudation involving several lobules.

Cellular thickening of supporting framework of consolidated areas.

Loss of capillary circulation in some parts of the pneumonic areas.

Caseation, very diffuse and usually softening, involving large portions of the pneumonic areas.

Ragged spaces (cavity formation) due to the caseation.

General lung tissue congested.

Giant-celled tubercular nodules, and granulations, may be present here and there, but not invariably so.

H.P. Terminal bronchi and air spaces of consolidated lobules generally blocked by products of effusion; outlines of walls may be indistinct.

Air spaces contain degenerating fibrinous material and catarrhal cells.

Supporting framework can be traced for some distance into consolidation, but becomes indistinct towards the caseous parts; structures staining feebly, and becoming granular or hyaline.

Tubercular granulations visible in parts of framework, and walls of air-cells frequently show large-celled infiltration.

Congestion of surrounding lung substance, and often widespread catarrh.

LUNG. CHRONIC TUBERCLE.

N.E. A few small rounded nodules in the section.

L.P. General lung tissue healthy or congested.

Rounded nodules, dense, fibrous, often caseous in centre, cellular at periphery, showing one or more giant cells.

A few adjoining air cells may be blocked by pneumonia.

Situations—walls of bronchi, vessels, interlobular septa.

H.P. Nodule consists of—

1. Fibrous or caseous centre.
2. Fibrous tissue, more or less cellular, pigmented.
3. Tubercle follicles or giant cell systems around the caseous centre.
4. Peripheral interstitial cellular increase.
5. A few air cells becoming pneumonic.

The nodules are only vascular at peripheral parts.

LUNG. ACUTE TUBERCULOSIS.

B.—Broncho-Pneumonic Form.

L.P. Scattered areas of consolidation, usually $\frac{1}{20}$th to $\frac{1}{10}$th inch in diameter, isolated or in clusters, becoming granular and caseous at their centres.

Each patch of consolidation consists of—

1. Terminal bronchiole.
2. Air spaces supplied by, and directly in contact with (1).
3. The walls of 1 and 2 thickened by small cell growth.

The outlines of the walls of air spaces can be seen at the periphery of each patch, often lost at the centre owing to caseation, which may be very extensive.

Contents of air spaces—

1. Fibrinous plugs (central and peripheral).
2. Catarrhal cells (nuclei visible) (usually peripheral).

Consolidation may be traced as arising in two ways—

1. Primary infection starting in air spaces.
   Secondary interstitial changes.
2. Primary infection starting in lymphatics of peri-bronchial or peri-vascular tissues.
   Secondary pneumonic changes in contiguous air spaces.

The patches are non-vascular except at the peripheral parts.

General lung tissue usually congested.

H.P. A broncho-pneumonic patch consists of—

1. Central terminal bronchiole plugged by pneumonic products, plug and walls may be hyaline, or granular and caseous.
2. Walls of infundibula and air cells thickened, cellular, non-vascular, becoming caseous.
3. Air-cells contain granular fibrin, catarrhal cells, leucocytes.

The contents of air spaces are distinct at peripheral parts and more catarrhal, towards the centre they are less distinct, becoming fused with the non-vascular and degenerating walls.

Injections (artificial, of vessels) do not pass into the capillaries of air-cells of consolidated patches.

LUNG— { CHRONIC PHTHISIS. / CHRONIC FIBROID TUBERCLE.

L.P. Large irregularly-branching masses of dense fibro-cellular structure, showing caseous foci and chronic tubercular growth closely investing these caseous parts.

Pigmentation of nodules.

Lung tissue between groups of nodules—

1. Congested.
2. Pneumonic in various forms. Especially marked around nodules.

Processes of breaking down, and cavity formation.

H.P. Nodules show central caseous area, often with pigment around, (corresponding to obliterated bronchus.)

Giant cell systems, as in chronic tubercle, but more numerous, and closely packed, and usually arranged around the central caseous area.

Reticulated or fibrous structure (fibroid tubercle) forming rest of nodule.

Around the nodules, invasion of the walls and cavities of air cells by large-celled growth.

Air-cells immediately around often show fibrinous exudation or catarrhal cells.

Nodules non-vascular except at peripheral parts.

Remainder of lung tissue between the nodules may be only congested or pneumonic, &c.

N.B.—The changes described under "Acute Phthisis" and "Chronic Phthisis," and also those of "Acute" and "Chronic Tuberculosis," are found variously combined in Common Phthisis, and may all be present in different parts of the same lung.

Chronic Interstitial Pneumonia is also frequently found.

KIDNEY. CHRONIC VENOUS CONGESTION.

L.P. Engorged—1. Straight venules of medulla.
2. Interlobular veins of cortex.
3. Malpighian tuft capillaries.
4. Intertubular capillaries.

2, 3, and 4 best seen near surface of kidney.

Pigment in tubules occasionally seen.

H.P. Engorged veins contain red blood corpuscles.

Malpighian tufts enlarged, the tuft filling the capsule; capillaries of tuft contain blood corpuscles and are dilated; walls of capillaries may be thickened.

Hæmorrhage into capsule of tuft, by rupture of capillary, may be seen occasionally, showing red blood corpuscles or pigment.

Capillaries of intertubular plexus engorged.

Casts of blood or blood pigment in tubules are seen when capillary hæmorrhage has taken place from Malpighian tuft; cast consists of brown or black granules, or fused blood corpuscles.

KIDNEY. WAXY.

Early Stage—

L.P. The parts showing waxy degeneration are—

1. Afferent arterioles of tufts.
2. A few capillaries of affected tufts.
3. A few intertubular capillaries (very slight and very few in number).
4. Straight arterioles of medulla.

Kidney otherwise may show no change.

H.P. Swelling and other characters of waxy change.

Advanced Stage—

L.P. Waxy degeneration has extended to—

1. Capillaries of tufts generally.
2. Efferent arterioles of tufts.
3. Capillaries of intertubular plexus.
4. Bowman's capsule (rarely).
5. Basement membranes of some tubules.
6. Connective tissue between collecting tubules near papillæ.
7. Walls of larger arteries and veins (middle coat) here and there.

The cortex shows atrophy, and convoluted tubules show degenerating epithelium.

Colloid casts, numerous in some cases, in convoluted and collecting tubes (stained bluish purple with methyl violet).

H.P. Epithelium of convoluted tubes granular, degenerating, or fatty.

Basement membrane of convoluted tubes in some parts swollen and waxy.

Structures above mentioned show the characteristic appearances of waxy degeneration, swelling, &c.

Some of the Malpighian tufts appear to be almost entirely homogeneous—capillaries obliterated by swelling of their walls.

Combined forms—Waxy, with fatty, interstitial, &c.

In advanced waxy degeneration, other changes very frequently combined, especially—

Atrophic changes in cortex.

Fatty degeneration, especially of epithelium of convoluted tubules.

Catarrhal inflammation. (See *Acute Nephritis.*)

Interstitial inflammation and growth of connective tissue, with consequent changes. (See *Interstitial Nephritis, Sub-acute and Chronic.*)

KIDNEY. CLOUDY SWELLING.

L.P. Portions of cortex appear denser than others, owing to swelling of epithelium in some of the convoluted tubules.

These show—1. Small stellate lumen.

2. Swollen granular opaque lining.

Malpighian tufts may show—

1. No change.
2. Increase in size, filling capsule, nuclear increase (slight).

N.B.—Organ not usually congested, except at bases of pyramids in straight vessels.

H.P. *Convoluted tubules show*—

1. Stellate lumen.
2. Epithelial cells—swollen, granular.
3. May in later stages show molecular disintegration of cells, especially at free margins, leaving a larger lumen, which is irregular and granular.
4. Nuclei of cells in advanced condition stain faintly; in early stages often brilliantly.

Malpighian tufts may be—(1) Normal; or (2) Swollen, filling capsule—swelling due to increase of nuclei in tuft; or (3) Hyaline change.

Leucocytes may be exuded (if change inflammatory); are seen especially along afferent arterioles, and where these enter the tufts.

KIDNEY. SUBACUTE INTERSTITIAL NEPHRITIS
(following Acute, or developing gradually).

L.P. CORTEX. Capsule not thickened—surface even.

Areas, corresponding mainly with the regions of interlobular arteries and Malpighian bodies, in which tissue appears dense.

Malpighian bodies in these areas enlarged, and appear more solid ; often show concentric lamination at outer part.

Tubules less distinct than normal, and smaller.

Between the more consolidated areas the tubules appear somewhat dilated.

Arteries in boundary layer often appear thickened.

MEDULLA. No marked change. May be casts in tubules.

H.P. CORTEX.

Malpighian bodies in various stages of change, which is characterised by

Swelling and thickening of Bowman's capsule (may be slight).

Proliferation of epithelium lining capsule ; cells swollen or multiplied, forming layers of cells, which fill the space between capsule and tuft.

Cellular thickening of tuft, which may obscure the capillaries ; or capillaries may be normal or dilated.

In advanced conditions the tuft, &c., may be degenerated or fibrous.

Around glomeruli and between tubules,

Great increase of cells, round or irregular in shape, and young connective tissue, separating the tubules and obscuring the capillaries. This most abundant near the arteries and beneath capsule.

Tubules—(*a*) Compressed or atrophied, epithelium small in affected areas.
(*b*) Showing catarrhal changes.
(*c*) Containing degenerated cells and fatty débris.
(*d*) Containing casts of various kinds.

Tubules in intervening parts (mainly straight and collecting).

May be somewhat dilated.
Epithelium mostly normal.
May contain casts.

MEDULLA shows little change.

Arteries.—Larger branches in boundary layer often have

Inner coat much thickened.
Middle coat apparently hypertrophied.
Outer coat continuous with surrounding fibrous thickening.

KIDNEY. GRANULAR CONTRACTED OR CIRRHOTIC.

N.E. Irregular outline at surface, dense patches alternating with more open tissue along cortex. Cortex diminished.
Thick walled vessels in boundary layer.
Cysts.

L.P. Capsule thick and in layers.
Marked atrophy of cortex.
Wedge-shaped areas of condensed and altered structure, showing—

1. Malpighian tufts closely packed in denser parts, and in various stages of fibroid degeneration—many nonvascular fibrous knots.
2. Greatly thickened and tortuous arteries.
3. Increased connective tissue throughout (slight or abundant.)
4. Compression of tubules—atrophy.
5. Casts. Colloid, hyaline, calcareous, &c.

Intervening tissue of cortex shows dilatation of convoluted tubules, with flat epithelial lining.
Healthy glomeruli, or with dilated capsules and shrivelled capillary tuft.
No interstitial increase, or at most slight, even in advanced cases.
Arteries.—Marked thickening of outer and of middle coat.
occasionally—1. Atheroma.
2. Endarteritis obliterans.

H.P. Of Wedge-shaped Patches and Bands—may be due to—
1. Atrophy with slight fibrous increase ; or,
2. Considerable fibrous interstitial thickening of old standing.
Malpighian tufts show, 1. Fibroid or atrophic degeneration, *i.e.*, nonvascular, small, fibrous-looking bodies.
2. Fibroid thickening of capsule ; tuft small, but capillaries patent.
Convoluted tubules.—Very small, with cubical non-granular epithelium, many containing casts, usually colloid, and mixed colloid with cellular or granular.

Intervening Areas.
Glomeruli.—1. Normal.
2. With much dilated capsule and shrivelled capillary tuft (sometimes capsule thickened.)
Convoluted tubules.—1. Dilated.
2. Lined by flat epithelium, this may be clear, usually more granular than in denser parts.
3. Contain casts.
Straight tubules.—Usually contain casts ; otherwise unaffected.
Arteries.—As under L.P.

KIDNEY. ACUTE NEPHRITIS.

A.—Form especially showing Catarrhal change.

L.P. *Malpighian tufts.*

1. Swollen (a few may be hyaline).
2. Increased number of nuclei in and around (variable).

Convoluted tubules show—

1. Cloudy swelling.
2. Increase of epithelial contents, which fill some tubules.
3. Casts—(α) Epithelial.
   (β) Granular.
   (γ) Mixed, hyaline, granular, &c.

Vascular changes very variable. Areas of leucocyte exudation here and there around smaller vessels.

H.P. *Malpighian tufts* swollen, often filling capsule, or may in some cases show partial hyaline degeneration. Increase of nuclei in tuft.

Leucocyte exudation into and around tufts, and around afferent arterioles (variable in amount).

Convoluted tubules show various changes. May be

a. Cloudy swelling and disintegration.

b. Proliferation of epithelium (catarrhal).

c. Masses of cells, derived from proliferated epithelium, filling tubules.

d. Degenerating cells, granular or with fatty particles.

Or may contain Casts.

a. Epithelial.

b. Granular.

c. Hyaline, or mixed forms.

Straight and collecting tubules may be unaffected, or also show catarrh, or contain casts.

KIDNEY IN GENERAL TUBERCULOSIS.

L.P. Small rounded or ovoid granulations, usually caseous, and often elongated in direction of medullary rays, showing great cellular increase in interstitial tissue.

The granulation includes one or two tubules and often a Malpighian tuft, the latter being nonvascular.

Situations.—Usually in cortex, though occasionally seen in medulla.

H.P. Granulation may be entirely composed of small lymphoid cells, or may show giant cell (very often absent).

Caseation occurs early, when granulation is still very small.

When tubules and tufts are involved in the tubercle granulation, caseation includes these structures.

Cloudy swelling, catarrhal changes, and slight diffuse interstitial cirrhosis often accompany tuberculosis.

LEUCOCYTHÆMIA.

L.P. Various conditions exist in different cases, the simplest form shows—

Engorged capillaries containing leucocytes leading to enlarged tufts, and hæmorrhage.

Leucocyte infiltration between tubules.

Atrophy of epithelium of tubules.

H.P. Tufts swollen, or if a hæmorrhage have taken place may be separated from capsule by leucocytes.

Interlobular capillaries distended by leucocytes.

Tubules.—Desquamation and atrophy of ephithelium, or may be normal.

Leucocytes as casts.

Pigment casts and pigment in interstitial tissue (rare).

KIDNEY. DISSEMINATED SUPPURATIVE NEPHRITIS ("SURGICAL" KIDNEY). PYÆMIC ABSCESSES IN KIDNEY.

STAINED TO SHOW MICRO-ORGANISMS.

L.P. Irregular, ill-defined areas, of various size, in cortex, and in lines in medulla, showing leucocyte infiltration and breaking down of tissues (early abscess formation).

Areas may be somewhat pyramidal if near surface, or elongated in direction of interlobular arteries, or irregularly rounded.

Deeply stained masses or areas of small size situated in glomeruli, or in capillaries between tubules, or more rarely in tubules (masses of bacteria).

H.P. The deeply stained masses found to be bacterial plugs in glomerular or intertubular capillaries (or rarely in tubules), or scattered irregularly in abscesses.

Bacteria may be micrococci, or more rarely rod-shaped bacteria.

Leucocyte infiltration and breaking down of tissues seen in parts where abscesses are forming. These are especially around the vessels.

Other inflammatory changes may be present in other parts.